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Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Sawmill Lubrication

Viscosimeter Calibration and Conversion Chart

PUBLISHED MONTHLY BY
THE TEXAS COMPANY

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Sawmill Lubrication

THE rapid decrease in the supply and increase in the cost of lumber during the last few years has forced the sawmill industry to develop in the direction of centralization, with larger units and more economical methods. Formerly the cutting of the tree, its transportation to the mill, the breaking up of the log into rough lumber, the finishing of this lumber into commercial material, and the marketing of this material to the consumer were distinct and usually uncoordinated operations. This naturally was an uneconomical method of production, generally involving a waste of good material and the loss of both H. P. and manpower. With the centralization of the industry came the use of more powerful and more economically operated machines, and the elimination of all unnecessary handling of the lumber as it passed from the tree to the finished product. By this centralization also the marketing costs were greatly lowered, as the only selling necessary was that by the manufacturer to the consumer. The consumer was also greatly assisted by the fact that he could purchase practically all the finished material needed from the company which actually produced the lumber. We now see the same company operating a logging department, a railroad department, a power plant, a sawmill department, dry kilns, and planing mills, besides sales and shipping divisions.

As operations became centralized and machines became larger coordination became more and more imperative. When only small machines were used the amount of material under operation even in centralized plants was not large, so that comparatively little space was required for storage between the various machines necessary to the complete operation, and a machine could be out of service for a considerable time without hampering seriously the operation of the other parts of the plant. With the large rapidly operating machines in present day use, however, the enforced shut-down of an edger, trimmer, head-saw or even live rolls will soon stop the operation of other machines either preceding or following it, unless enormous storage is provided between machines. This, of course, is very uneconomical. The cost of a shut-down soon runs into money and particular care must therefore be exercised to see that each machine is continuously in operation.

No factor in this continuous operation of machines is more important than lubrication. An improperly lubricated bearing or the application of an oil or grease unsuited for the purpose may cause greater loss in a short time by reason of delays than the cost of lubrication for the entire year. One of the most important considerations in the matter of lubrication is the speed and accuracy of the work. Logs are

LOG SKIDDER AND LOADER AT WORK. These powerful machines are capable of dragging the logs from considerable distance in the forest, and loading them onto flat cars.

Courtesy of the Long-Bell Lumber Co.

LOG POND. Logs are here received and sorted. The dirt is given an opportunity to wash off before the logs pass into the mill. In the background will be noticed the conveyor by means of which the logs are dragged up into the mill.

© *Underwood and Underwood.*

LOG CARRIAGE OF HEAD-SAW. Logs are held in position by dogs shown on the left. The log passes into the background where the head-saw cuts off cants or slabs, which drop onto live rolls and are carried to other machines.

Courtesy of the Long-Bell Lumber Co.

sawed at almost unbelievable velocities and with an accuracy as to dimensions that would cause wonder to the old-time sawyer. This can only be brought about by exactly designed and aligned bearings, whose operating pressures may be very high at one moment and low at another. The lubricant must take care of this variation in load satisfactorily. In dealing with the lubrication of the various machines in a modern sawmill plant we shall follow the course of the timber from the forest to the finished product.

Logging

The larger operators in developing a lumber tract first build a main line railroad into the forest from which temporary spurs can be run off as necessary. Camps are usually established for convenience in operation. In cutting the tree it is first notched on the side towards which it is to fall, in order that it will not split when felled. Trees are no longer cut with an axe, as the two-man cross-cut saw is much faster, and in addition to saving labor it also saves at least an extra foot of the best end of the tree. There are several ways of getting the log to the branch line of the railroad, depending on the conditions. If the tree is within 600 or 800 yards of the track it can be snaked in by means of large steam skidders. These skidders also are equipped to load the logs onto the lumber car. This type of machine is practically necessary where the land is too marshy to permit the use of teams. Under similar conditions some operators use an overhead cable or telpher, supported by two trees, one end being at the skidder and the other end 2,000 feet or more in the swamp. A pulley arrangement looking something like a bicycle with grooved wheels, is mounted on this cable. To this pulley is attached a large block, carrying a pulling cable and a line for returning the pulley to position. A pair of tongs is lowered from this block and placed over the log and when the "pull signal" is given the front end of the log is taken clear of the ground and the bicycle begins to travel towards the skidder with such speed that in instances where the butt end of the log comes in contact with even large standing trees they are broken off as if they were mere reeds.

The skidders are equipped with vertical boilers and reversible or link motion reversing engines, all of which are mounted on a powerfully constructed flat car. While this work necessitates a rough life, the operator of this rig is usually a very expert handler, and is at once the success or failure of the camp. The skidder engine usually carries from 150-175 lbs. steam pressure and works under widely varying conditions, sometimes using comparatively dry steam while at other times highly saturated steam. This condition is also true of the locomotive used to carry the logs to the mill. This demands that a cylinder lubricant be used which is capable of meeting a wide range of conditions satisfactorily. The cylinder lubricant, therefore, should contain a fair amount of compound in order to meet the wet steam conditions. A lubricant of about 125-140″ viscosity, Saybolt at 210° F. and containing from 6 to 10% of suitable fatty oil, has been found to be very efficient in meeting these conditions. The reciprocating parts of the locomotive and skidder, on account of the fact that they are usually subjected to rough and exposed conditions and may not be exactly aligned, require a fairly viscous lubricant in order to assure of their continuous operation. A lubricant of at least 500″ viscosity, Saybolt at 100° F. should be used and generally one of about 750″ is found preferable. Where grease is necessary care should be taken to see that it is regularly applied and is of a dependable character. A medium grade will generally be found to meet all conditions.

Instead of skidders or in connection with them most camps find it practical to use logging wagons to bring the logs to the skidder, or to the end of the skidway. These wagons are equipped with great steel tongs which are capable of lifting the logs onto the wagon or dragging them to the skidder.

Forest to Mill

After a number of log cars have been loaded they are hauled to mill and the logs dumped into the log pond. Where water transportation is available the logs may be hauled or dragged to the river and floated to the mill. This is particularly true in the case of some plants situated in the north, where cutting is usually

done in winter and advantage is taken of the ease of hauling logs on sleds over iced log roads. As log roads are easily constructed in winter they can be brought quite close to the place where the logs are cut.

The log pond at the mill not only serves to provide a storage for sorting the material so as to be best handled by the mill, but also allows the dirt and stones to wash off and causes the logs to go to the saws in a wet condition which assists in good sawing. When the mill is ready to receive the logs they are floated one by one to a chain conveyor which extends from the log deck in the mill to beneath the surface of the pond, where there is a spool or sheave around which the chain revolves. This chain is equipped with spikes or dogs which grip the log and carry it up to the log deck and into the mill. In its passage to the mill the log is sometimes subjected to a powerful water spray to remove any dirt and stones not washed off in the pond. This chain is driven by what is commonly known as the log jack, which is a powerful reduction gear carrying a sprocket wheel. The foot sheave at the bottom of the chain is generally hinged so that it can be frequently examined and properly cared for. The chain is subjected to extreme duty, and while its travel is slow it is in almost constant use. The lubricant for the gears, therefore, should be a highly viscous product that will not readily wash or throw off and will stick tenaciously to the teeth. As this type of product at ordinary temperatures is very viscous and sticky, it must be applied hot to the gears. Sometimes there is placed in the log pond near the conveyor a small reciprocating drag-saw which cuts logs approximately to the lengths desired.

At the top end of the conveyor is placed a steam kicker whose function is to push the logs sidewise from the chain, usually without stopping it, to the log deck which slopes gradually down towards the log carriage of the head-saw. There is usually placed a set of live rolls between the log deck and the log carriage, and the log is carried across these rolls to the carriage by means of a steam or electric loader, whose arms act first as a stop for the log when rolled down from the conveyor, but when released act as a bridge that the logs may cross the live rolls.

Head-Saw

The logs are generally first sawed into cants or slabs by a giant saw called a head-saw. Formerly this saw was a very large circular saw, and such is still sometimes used in small plants, but modern plants have almost universally superseded this with the band-saw. These band-saws are from 9 to 16 inches wide and run at very high speed, usually about 10,000 feet per minute. As the band-saw is an expensive proposition some operators precede it with two small adjustable circular saws called rock-saws, whose duty is to just cut through the surface of the log and receive any damage due to rocks or sand imbedded in the bark. The function of the log carriage is to carry the log and force it up to the head-saw, end on. When the log is transferred by the loader onto the carriage the head sawyer instantly signals to his assistants and the log is pushed hard against the head and knee blocks of the carriage by a steam nigger or log turner. This piece of apparatus is capable of turning the log rapidly into such position that it can be cut to the best advantage. The head sawyer must decide instantly from the looks of the log how it can best be handled, and his position is an exceedingly important one. When the log has been turned into proper position the various knee blocks are moved up tight against the log by several men called carriage men, and it is securely fastened against further movement by dogs attached to the knee blocks. There is another man on the saw carriage called a setterman, whose duty is to operate a set works which pushes the log outwards to the saw and can be adjusted quickly to within 1/16 of an inch so as to get the proper thickness of cant desired. After the log has been securely fastened to the carriage the latter is forced past the head-saw and the cants or cuts fall off onto the live rolls which carry them to the further operations. The speed of the head-saw is controlled by the head sawyer and he also judges whether the log can best be cut into timber of large dimensions or must be sawed into planks. On account of the terrific din he must transmit his orders by hand signals, somewhat similar to those used in the deaf and dumb language.

(Continued on page 9)

Viscosimeter Calibration and Conversion Chart

IT is unfortunate that to many users of oil the word "Viscosity" has no other meaning than the time required for 60 cc. of oil to flow through a Saybolt Viscosimeter. A characteristic of this instrument is that readings for all oils at high temperatures approach the same minimum, and is responsible for the common but erroneous belief that at high temperatures all oils have the same viscosity. Not only is this idea false but it may lead to serious consequences, such as the use of a light spindle oil in steam cylinders working under high superheat. Such a ridiculous conclusion has even led some of those with practical experience, who do not comprehend the real meaning of viscosity, to doubt that viscosity is any measure of the value of a lubricant.

The difficulty is that a clear distinction is not made between "absolute viscosity," the real measure of fluid friction, and "Saybolt Viscosity," the arbitrary commercial means of measuring absolute viscosity. In judging the relative performance of oils in service absolute viscosity must be the basis of comparison, either directly or indirectly.* This is in no way a criticism of the Saybolt readings for commercial work, for the Saybolt is the simplest and most reliable instrument yet devised for every day routine work, but engineers must not use the Saybolt readings interchangeably with absolute viscosity when comparing different oils. This subject was gone into at length in the July 1920 issue of LUBRICATION, and a chart was given by which the readings of the Saybolt and other viscosimeters could be converted to absolute viscosity or to each other. The data presented was taken from sources believed to be reliable. Since that time certain research work has necessitated a careful calibration of instruments in the laboratories of The Texas Company, and the data secured is now published in the form of the accompanying chart, which is much more complete than the one published previously. Each point shown is the average of at least two readings and a key is given to show the fluid used.

*For convenience in computations, the term "kinematic viscosity" is used frequently. It is an indirect measure of absolute viscosity, being merely absolute viscosity uncorrected for specific gravity. Thus absolute viscosity = kinematic viscosity × specific gravity at the same temperature.

Viscosimeters Calibrated

The *Saybolt Universal* tube calibrated (#201) is representative of the Saybolt viscosimeters as now supplied by the manufacturers. This instrument, as is well known, is standard in the United States.

The new *Saybolt Furol* Viscosimeter which has just been adopted for fuel oil by the U. S. Government, was also calibrated (#32). This instrument will probably be adopted by the American Society for Testing Materials at its coming meeting. It will be observed that all readings above 80″ are one-tenth of those obtained with the Saybolt Universal.

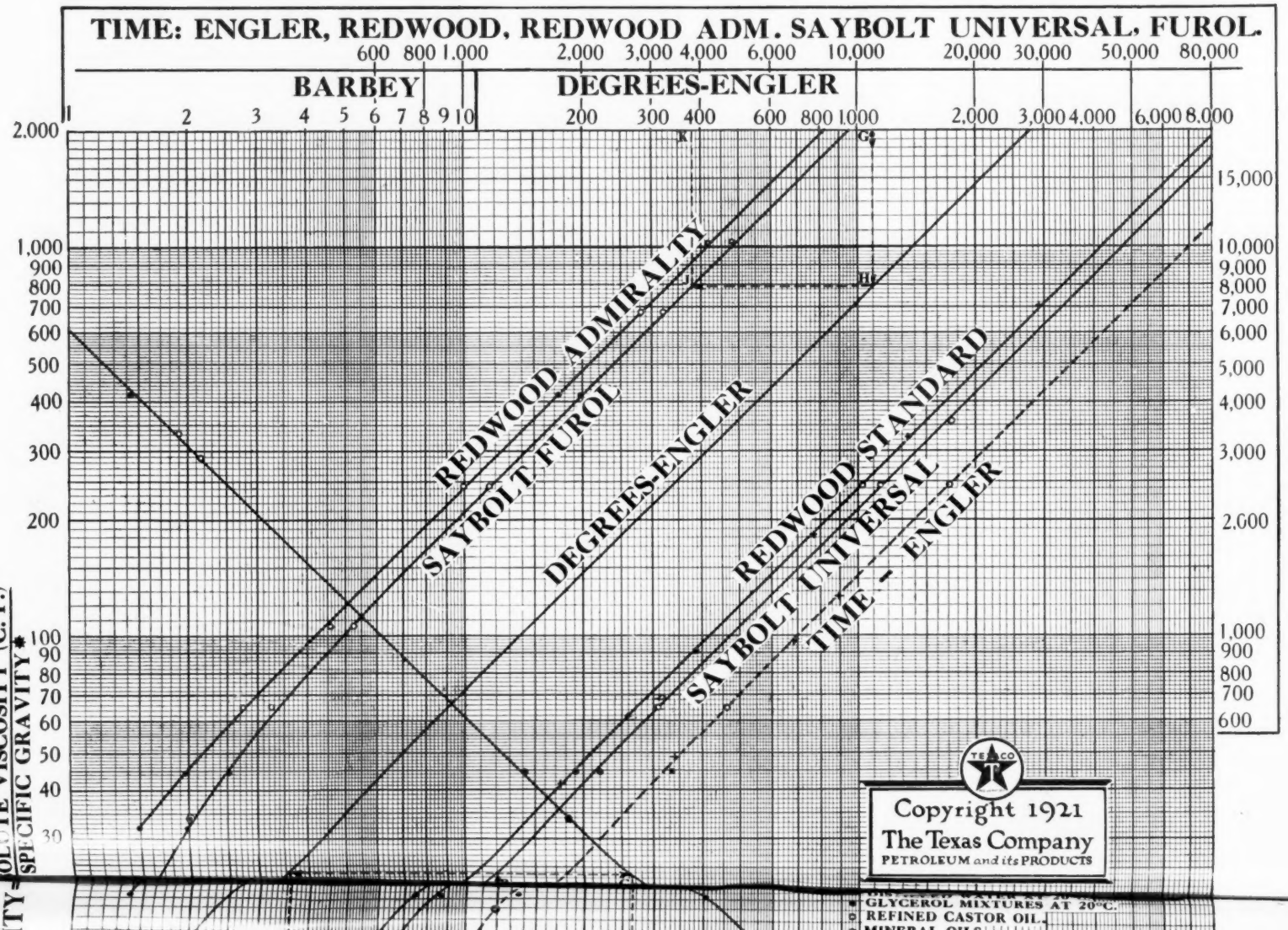
A *Redwood Standard* Viscosimeter was also calibrated (#1326) in the same way, the results being almost identical with those published by Archbutt & Deeley for a similar instrument in their possession.* This instrument is standard in Great Britain.

A *Redwood Admiralty* instrument (#737) used for fuel oil by the British Admiralty, gave a curve which above 25″ was one-tenth of Redwood's Standard. Both of these fuel oil instruments are intended to give readings at high viscosities exactly one-tenth of those of the standard instruments of the same makers.

With the *Engler* instrument, viscosity in *Engler-degrees*, is intended to be expressed as the ratio of the efflux time of the oil tested and the efflux time of distilled water at 20° C. Accordingly, the efflux time, or *Engler-time* curve is shown dotted on the chart as a matter of interest only, but the curve for *Engler-Degrees* is the one which should be used. The calibration curves on the chart were obtained from an instrument marked #SR-2607, standardized in Germany by the Physikalisch-Technische Reichsanstalt. This instrument is standard in Germany.

The *Barbey Ixometer* is a very interesting instrument which differs in several particulars

* Archbutt & Deeley, p. 180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BARBEY
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PETROLEUM and its PRODUCTS
GLYCEROL MIXTURES AT 20°C.
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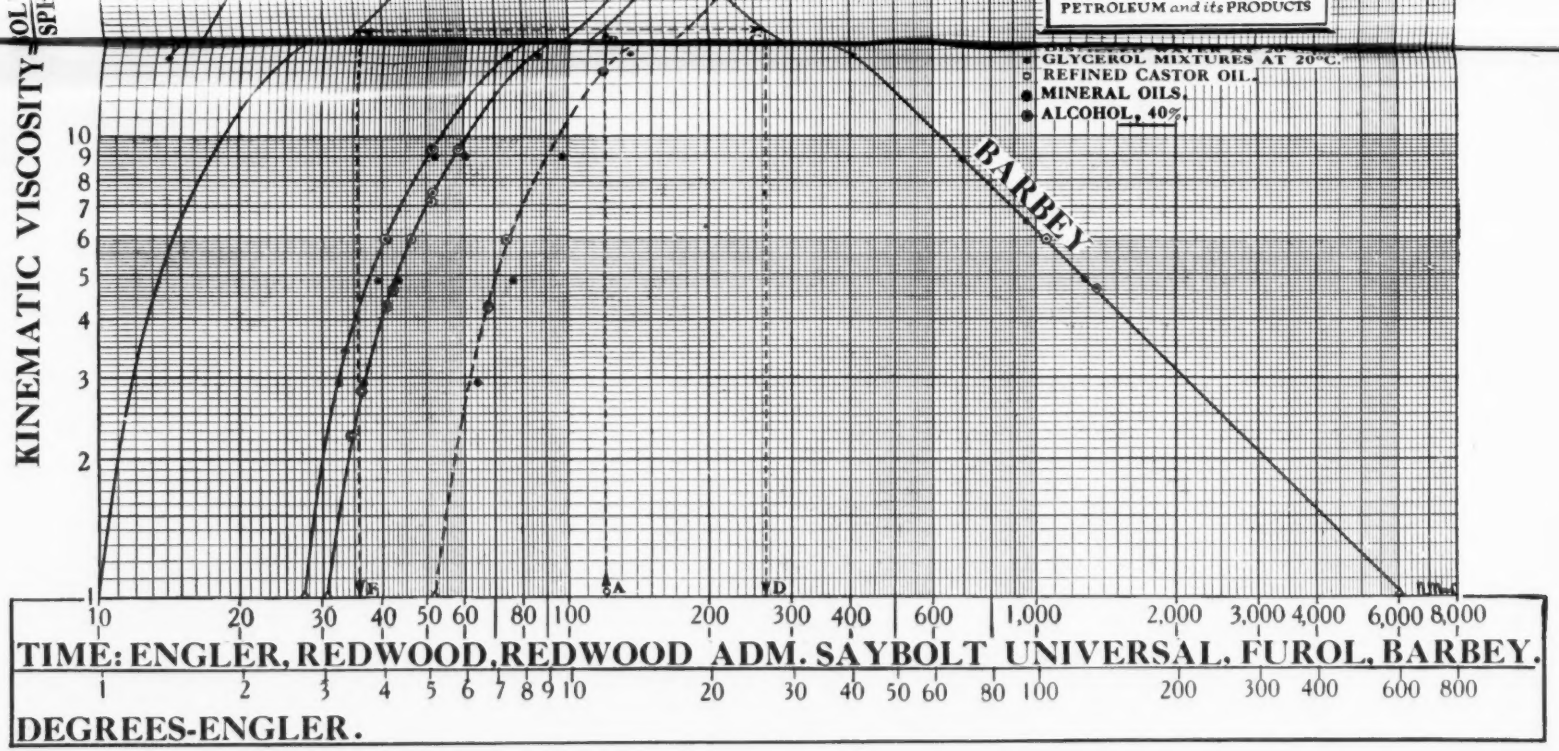


* Specific Gravity taken at the same temperature as the viscosity reading.

VISCOSIMETER CONVERSION CHART

DIRECTIONS FOR USE OF CHART

OBJECT: To find the viscosity reading of a particular oil on any of the standard viscosimeters when its reading on one of the viscosimeters has been determined by experiment **at the same temperature.**

SCALES: There are two sets of scales which **must not be confused** with each other.

X: The scales at bottom and left hand side go together. They are the ones regularly used in practice applying to all ordinary oils.

NOTE: There are two lines of scales at the bottom:
(a) The **lower** scale applying only to **degrees**-Engler.
(b) The **upper** scale applying to all other readings, including Engler-**time.**
In simply changing from one viscosimeter to another the scales at left and right are not used.
The scales at top must never be used in connection with those at the bottom.

Y: The scales at top and on right hand side go together. They are rarely used, applying only to very viscous products beyond range of other scales.

APPLICATION OF CHARTS: X: For ordinary cases.

GIVEN: Saybolt Universal Viscosity = 120″.

DESIRED: Case (a) Barbey reading.
Case (b) Engler-degree reading.

PROCEDURE: Find point on bottom scales for Saybolt Universal corresponding to 120″ (A).
Follow up vertically to curve marked Saybolt Universal (the known instrument) (B).
(a) To get Barbey reading: Follow horizontally to curve marked Barbey (C).
Drop down to bottom scale for Barbey and read (C). Reading = 265°.
(b) To get Engler-Degree reading: Follow horizontally to curve marked Degrees-Engler (E).
Drop down to **lower** of the two bottom scales, for Engler-Degrees and read (F). Reading = 3.62°.
i. e., 120″ Saybolt = Barbey 265° = Engler 3.62.

Y: For very viscous fluids beyond range of other scales.

GIVEN: Engler-Degrees = 1100°.

DESIRED: Saybolt Furol reading.

PROCEDURE: Find point on upper scales under Degrees-Engler corresponding to 1100° (G).
Follow vertically down to Degrees-Engler curve (H).
Follow horizontally to curve marked Furol (J).
Rise vertically to scales under Furol and read (K). Reading = 3800″.
i. e., 1100° Engler = 3800″ Furol.

from the other efflux viscosimeters, due primarily to having a very long outlet tube (200 mm.) with a rod inserted along its axis to increase the resistance due to viscosity, and secondarily to operating with a constant head (100 mm.) of oil by means of an overflow from the oil reservoir into which a stream of oil is run from an auxiliary reservoir. The flow of oil through the instrument is regulated until the desired temperature is obtained, then the discharge from the tube is caught in a graduated container for ten minutes, from which the volume of flow per hour is computed. The volume is read after immersing the container in the water bath for a few minutes so as to correct for any change in temperature due to passing through the air after leaving the tube. This is a correction that cannot be made with the other viscosimeters, in which the volume of oil discharged may be read at a different temperature from the bath, if the bath temperature is much higher or lower than room temperature. Since the rate of flow is uniform, the actual time taken in making readings may be varied if the fluid tested is very viscous or very fluid.

This is the only instrument tested which from theoretical considerations was expected to show a straight line relation between its readings and kinematic viscosity all the way down to water at 0° C. It is accordingly the only instrument for which a standardization with water would have any definite meaning for fluids of high viscosity. The designers of this instrument have intended it to be standardized to give a reading of 100° with pure Raw Rapeseed Oil at 35° C. Unfortunately different samples of Rapeseed vary in kinematic viscosity, and this is probably responsible for the fact that three Barbey instruments calibrated gave different values for the "instrument constant," which is the product of kinematic viscosity and Barbey degrees, for all readings.

Calibration of Viscosimeters

The method first adopted for this calibration work was the one recommended by Archbutt & Deeley, by which careful readings at 20° C. were made of several mixtures of glycerine and water of various concentrations. By means of tables* the absolute viscosities of these mixtures were found from their specific gravities. As a check, readings of Refined Castor Oil were made at several temperatures because different samples of refined castor are so uniform that tables are available showing its absolute viscosity at various temperatures.** The results were thought to be quite accurate because both the glycerol and castor points fell on a straight line for the Barbey Ixometer.

Alcohol mixtures*** were also used for calibrating, as is recommended by the Bureau of Standards, but it was found that they gave different curves between viscosities of 1 cp. and 30 cp. on all instruments except the Barbey. Since there was then no doubt about the calibration of the Barbey instrument, it was a simple matter to determine the kinematic viscosity of several mineral oils and use them also for calibrating the viscosimeters. These points fell on the curve determined by the alcohol mixtures from which it was concluded that the glycerol points should be disregarded where they differed from the others. The surface tension and density of alcohol mixtures are much nearer those of mineral oils than glycerol mixtures.

It is necessary to call attention to the fact that it is commercially impossible for manufacturers to produce even two viscosimeters of identically the same dimensions. Not only are the calibration curves shown accurate for the particular instruments tested, but the chart is applicable to other instruments, without introducing errors greater than ordinarily existing with routine readings, provided the instruments do not differ materially from the average dimensions of that design.

Conclusion

While this chart makes simple the conversion of commercial viscosimeter readings to terms of absolute viscosity, provided the specific gravity at the same temperature is known, its greatest use to most people will probably be in converting the readings of one commercial instrument to the equivalent of another make of instrument. Directions for making such a conversion are given with the chart.

*Archbutt & Deeley, p. 161.
**Tech. Paper No. 112—Bureau of Standards, p. 24-25.
***Scientic Paper No. 298—Bureau of Standards, p. 77.

SAWMILL LUBRICATION

(Continued from page 4)

It is sometimes considered most practical after the first cut is taken to turn the log and take cuts to square it before cutting into slabs. In quarter-sawing cuts are taken so that boards are as near radial to the centre of the log as practical. Some mills cut the log first into thick cants or timbers and then re-cut it into boards on re-saws. This operation makes for economy, as the re-saw requires less thickness of cut and hence less loss is sustained than by the use of the large head-saw. Re-saws may be of the single or of the gang type. If single, a horizontal band-saw may be used, while the gang type consists of a number of parallel circular saws. Some mills double-cut the log on its return from a passage by the use of a head-saw with teeth on both edges, but this is not found generally to be economical as it does not give the head sawyer a chance to examine the face of the cut and change his setting if found advisable.

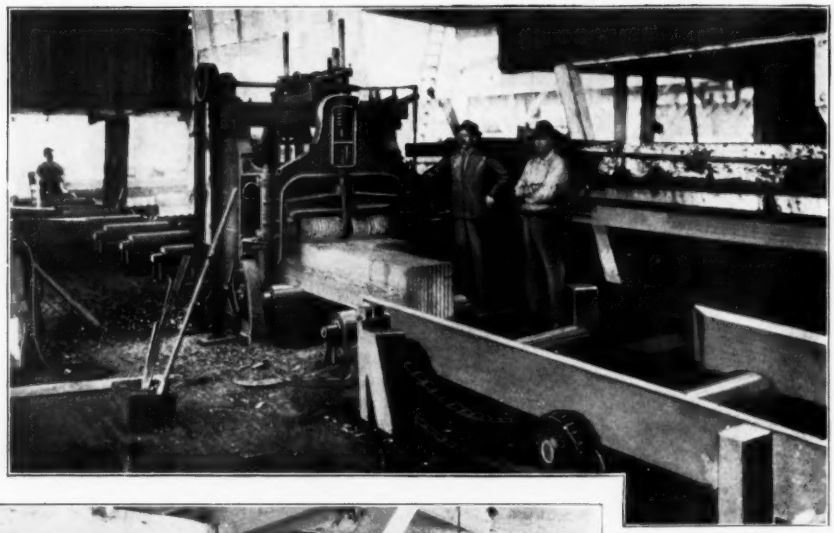
It is regularly recognized that both the band-saw and re-saw must necessarily operate against a terrific strain, certainly enough, plus the tension in the saw, to provide against snaking and the production of a non-uniform line. The strain on the band wheel, in connection with the high speed, demands a highly dependable lubricant, although the bearings are usually water jacketed. While some mill foremen and sawyers use a blend of steam cylinder oil with a cheap engine oil, on account of the importance of the work it would seem far more advisable, as well as economical, to use a straight mineral product, properly refined, of 500″ Saybolt viscosity at 100° F.

While there are some electrical installations, the log carriage is usually operated by means of either a steam engine or a steam plunger cylinder. In either case the apparatus is equipped with valves so that it can be controlled by a lever in the hands of the sawyer, and can be moved at any speed or stopped whenever desired. Usually the boilers producing the steam used in these cylinders are located at a considerable distance from the carriage, and the steam reaches the valves in a highly saturated condition and at a pressure much lower than that indicated by the boiler gauge. Care must be taken, therefore, to use a cylinder oil which will give proper lubrication under these wet steam conditions; that is, it should carry sufficient compound so as not to be washed readily from the cylinder walls by the condensed water. For this work a steam cylinder oil of 125-140″ Saybolt viscosity at 210° F., carrying from 6% to 10% of suitable fatty oil as compound, will give satisfactory lubrication. If conditions are extraordinary, however, it may be necessary to use a grade of cylinder oil with a different viscosity or a slightly different percentage of compound. It is believed, however, that the above grade will meet most conditions satisfactorily.

The steam kicker, steam nigger, or steam loader are usually operated by small steam engines or steam cylinders, though in some cases electrical equipment has been installed. In the case of steam equipment the same conditions hold as enumerated under the log carriage, and a cylinder oil of 125-140″ Saybolt viscosity at 210° F. will give general satisfaction.

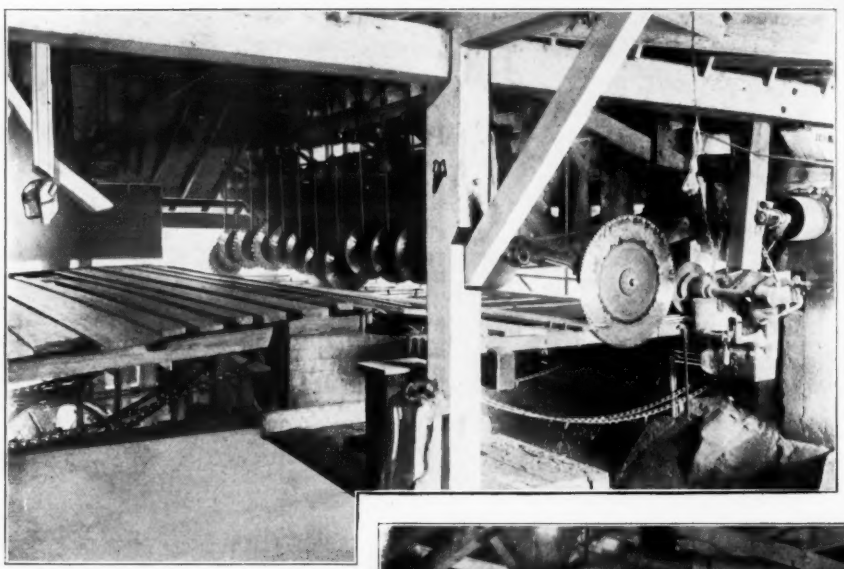
Edger

As line after line is cut at the band mill the boards and cants fall onto the live roll conveyors and are passed by them to the edger, which, if they have not been squared on the carriage, or if a wane or bark edge is visible, removes the undesirable portion and squares up the edges of the plank. This machine is equipped with 5 to 7 saws so spaced on the arbor that they can be readily and rapidly adjusted to produce any width of boards that the edgerman may deem desirable. By this adjustability also the boards can be cut so as to eliminate bad spots or inferior wood. Edgers generally can be run at different speeds in order to take care of various thicknesses of cants. The saws are of circular type and may have removable teeth. As this is a high speed machine of extremely heavy duty and requires great accuracy of bearing adjustment, it should use a high grade oil. If the bearings are ring oiled and close fitting, an oil of 180-200″ Saybolt viscosity at 100° F. will give satisfaction, but if the feed is not regular or bearings not close fitting an oil of 300″ or even 500″ viscosity should be used, so as to assure that there will be no heating or shutdown.



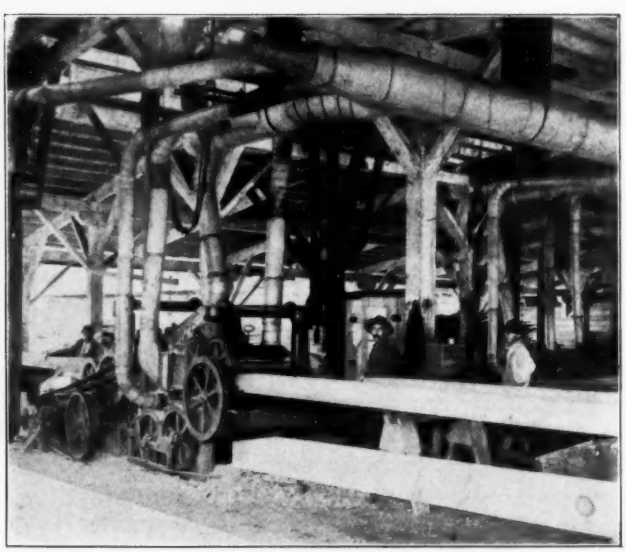
GANG SAW. A large timber can be thus sawed up into a number of boards simultaneously. The timber is held in position by press rolls, and the saws are of circular type on a single shaft.

Courtesy of the Long-Bell Lumber Co.



TRIMMER. Notice number of circular saws which can be brought into action in any combination according to the length of board desired or the necessity of cutting out defects.

Courtesy of the Long-Bell Lumber Co.



PLANING MILL, showing a large timber being dressed for the market.

© *Underwood and Underwood.*

Trimmer

The boards carried from the edger are transferred sidewise by means of several chains equipped with dogs so adjusted as to bring the boards up to a square alignment on the saw table of the trimmer, by which they are cut to standard lengths, usually differing by two foot intervals. The trimmer consists of a number of parallel saws separately hung, and so arranged that any one or any number can be brought into operation at will by means of a keyboard. This allows the sawyer to cut out any defects in the board or to cut boards most advantageously and to the lengths called for by the specifications. Where large timber is worked, a single saw of 50-60 inches in diameter is generally used instead of the gang arrangement. The trimmer is a high speed machine subjected to quite a bearing load and should use a lubricant with a Saybolt viscosity of from 200-300″ at 100° F.

The same condition as to bearing fit and method of oiling hold here as mentioned under the edger. In some cases it may be advisable to use a 500″ viscosity oil, but generally a 300″ oil will be satisfactory.

Lath and Fuel Machines

The strips cut off of the edges of the cant by the edger are rough on one edge and are only useful to make lath or cut up into fuel. If suitable for lath they may be first run through a slasher whose function is to cut into the proper length of about four feet. The slasher consists of a number of parallel circular saws spaced four feet apart and the strips are fed sidewise to it.

The lath machine consists of a number of parallel circular saws on the same shaft and spaced apart the thickness of the lath. The material from the slasher or boards cut in four foot lengths are fed endwise to it and come out either lath or waste. The lath may be bundled on another machine.

The material unsuitable for making marketable lumber, is usually burned as fuel, thus furnishing steam for the plant. Before it can be so used, however, it must be broken up into small fragments or chips. This is done by masticators or hogs. They operate at fairly high speed and as they may be called upon to break up chunks 6 to 8 inches in diameter, they must be quite rugged.

The lubrication of slashers and lath machines is similar to that of the edger, but the masticators or hogs require a higher viscosity oil. The bearings of the latter machines are subjected to terrific strain and great vibration, and may as a result run quite warm. Under these conditions it is better to use an oil of 500″ viscosity Saybolt at 100° F., or even an oil of higher viscosity in order to prevent the lubricant from being forced out of the bearings.

Kilns

After the boards have left the trimmer they are loaded onto small trucks preparatory to passing them on to the dry kilns. Formerly, lumber was dried in the open, but as production has increased so rapidly it has been generally found more economical to dry them in steam heated kilns. This can be done in a small fraction of the time previously used, and produces a more uniform grade of lumber. When the kiln is filled to capacity, say with 15-20 trucks, each end of the kiln is closed, the steam turned on and the temperature raised in varying degrees to 250-300° F. If this schedule of temperature is maintained, dry lumber may be expected in from 60 to 72 hours. The temperature and time of drying, of course, depends on the thickness and character of the lumber. If the temperature and humidity are not controlled quite exactly or if proper ventilation is not furnished, the batch of lumber may mildew or stain or be otherwise impaired. It is usual to stack boards on end or edge and have the heating coils underneath.

The lubrication of the trucks used in dry kilns, on account of the high temperature to which they are subjected, is quite a problem. No oils or greases can be regarded as practical, but a highly viscous and adhesive straight mineral product similar to that used on gears can be employed. Such a product with a viscosity of about 1,000 or 2,000″ at 210° F. has proven satisfactory and has given good results for this work.

From the kilns the lumber is conveyed to sorting sheds where it is graded and may either be placed on the market as rough lumber or sent to the planing mill.

Live Rolls

In transferring the cants and boards from one machine to another and finally to the "green deck" ready for the kiln, the operation is usually done on either live rolls or by chains. These may be either gear or chain driven but run at fairly high speed, and their lubrication is quite important though often sadly neglected. Some mills use black oil for this purpose, but it is believed that better results can be obtained by using a more dependable product. If the gears are sufficiently protected as not to be subjected to flying sawdust, a viscous straight petroleum product with high adhesive properties is most satisfactory. A single hot application of a product of 1000″ Saybolt viscosity at 210° F. will last for a very long time and not drip from the gears. If there is much flying sawdust it is necessary to use an oil that will wash this product from the gears. In this case it is advisable to run the gears in a bath of oil with a viscosity of about 750″ Saybolt at 100° F.

Planing Mill

At the planing mill the rough lumber is dressed and formed into shapes desired for the market. There are a variety of machines in this mill, as matchers, surfacers, moulders, etc., and most of them are of the high speed type, designed at once for volume and accuracy. The heads of the planer often carry extremely heavy duty and nowhere in the sawmill is lubrication more important than in this case. In former times castor oils were generally used but now it has been proved that straight mineral oils are vastly better, showing higher efficiency without the accompanying defects of an animal or vegetable oil product. A straight mineral oil of about 300″ Saybolt viscosity at 100° F. has been found to give complete satisfaction in the majority of cases, though under some circumstances a 500″ oil may be necessary.

Trucks

The lumber from the sawmill or planing mill in large plants is usually conveyed to the sorting sheds by electric or gasoline trucks. In some cases tractors with a number of trailers are used, while in others traveling cranes have been found to pay for themselves.

Electric trucks can generally be lubricated by a 300″ oil, though on the wheel bearings a product of 750″ Saybolt viscosity at 100° F. may be necessary.

Gasoline trucks or tractors should have their engines lubricated by motor oil especially suited for the engine and not by the regular shop oil. Some plants have found it economical to use large machine stackers instead of hand labor.

Power Plant

Not many years ago sawmill plants used only steam for motive power, but electric motor individual drive of each machine is becoming more and more prevalent in the modern plant. Motors eliminate shafting and will stand momentary overloads that would stall a steam engine. Likewise steam turbines are being installed in many plants as the most economical method of producing electric power. For the lubrication of turbines an oil is required that will not emulsify with water. Usually an oil of 180-200″ Saybolt viscosity at 100° F. will give satisfaction, but a more complete discussion of this will be found in the February 1921 issue of LUBRICATION.

The electric motors around the plant can usually be lubricated satisfactorily by an oil of 300″ Saybolt viscosity at 100° F. though small motors need only use a 180-200″ oil.

Summary

We have considered above in a general way the operation of the principal machines in a sawmill and have specified the type of lubricants which have in the majority of cases been found to give satisfaction. It is impossible to give more than a general recommendation in each case, as types of machines vary to such an extent in their bearing design and methods of applying the lubricant that a low viscosity oil may operate satisfactorily in one machine and yet not be "heavy" enough in another equivalent machine to prevent metallic contact. And again, the range in temperatures between summer and winter conditions or between northern and southern climates is so great as to make it almost advisable to list three or more grades of oil in order to get the best operation under the extreme conditions.

We have specified the grade of oil which in our judgment will operate in the majority of cases. As a general rule it is better to operate with a high viscosity oil and have a little heating than with an oil of too low viscosity and have a burned out bearing. But the best procedure of all is to get in contact with the lubrication engineer of some reliable company and get the benefit of his experience.

EDGAR C. RUWE CO., INC.
Printing
47 West Street, N. Y. C.

TEXACO LUBRICANTS for SAWMILLS

AS conditions differ considerably among various types of machines and temperatures have a very large controlling effect, two grades of lubricants are listed:

A—Lubricants to be used generally in Winter, or in case bearings are ring-oiled and close fitting.

B—Lubricants to be used generally in Summer, or in case bearings are worn and loose.

A Lubricants are less viscous than B.

MACHINES

	A	B
Band Saws and Set Works	TEXACO ALEPH OIL	TEXACO ALTAIR OIL
Edgers, Trimmers, Resaws	TEXACO ALEPH OIL	TEXACO ALTAIR OIL
Slashers and Lathe Machines	TEXACO ALEPH OIL	TEXACO ALTAIR OIL
Masticators or Hogs	TEXACO ALTAIR OIL	TEXACO PELICAN OIL
Surfacers, Moulders, Matchers	TEXACO ALEPH OIL	TEXACO ALTAIR OIL
Shafting	TEXACO ALTAIR OIL	TEXACO PELICAN OIL
Live Rolls	TEXACO PELICAN OIL	TEXACO CRATER COMPOUND No. 1
Kiln Trucks	TEXACO CRATER COMPOUND No. 1	

ENGINES

Steam Cylinders		
Dry Steam—High Pressure	TEXACO LEADER CYLINDER OIL	
Wet Steam—Low Pressure	TEXACO PINNACLE CYLINDER OIL	
Skidders and Loaders	TEXACO ALTAIR OIL	TEXACO PELICAN OIL
Miscellaneous Engine Parts	TEXACO ALTAIR OIL	TEXACO PELICAN OIL
Miscellaneous Machine Bearings	TEXACO ALEPH OIL	TEXACO ALTAIR OIL
Miscellaneous Machine Slides	TEXACO ALTAIR OIL	TEXACO PELICAN OIL

ELECTRICAL EQUIPMENT

Turbines	TEXACO REGAL OIL	
Motors, *Small*	TEXACO REGAL OIL	TEXACO ALEPH OIL
Large	TEXACO ALEPH OIL	TEXACO ALTAIR OIL

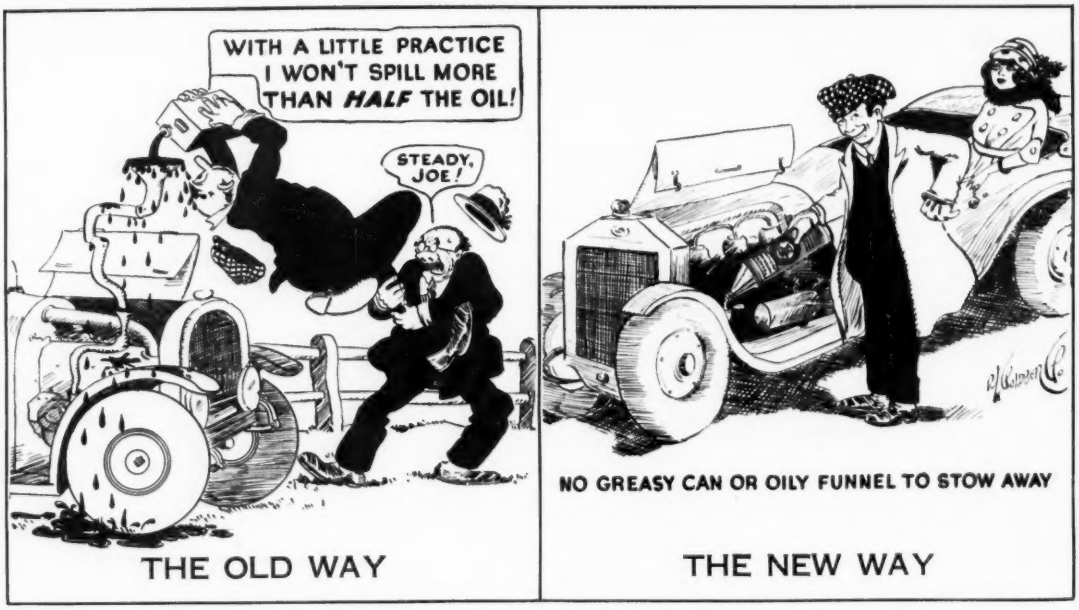
MISCELLANEOUS

Auto Trucks	TEXACO MOTOR OIL (*proper grade*)
Tractors	TEXACO TRACTOIL (*proper grade*)
Gears, Ropes, Chains	TEXACO CRATER COMPOUND No. 1
Grease Cups	TEXACO GREASE No. 3

The above list covers the principal machines under average conditions. If you have a machine which is not listed, or which is an especial type, or operating under unusual conditions, you are invited to call on us and we shall be more than glad to tell you the right oil to use.

There is a Texaco Lubricant for Every Purpose

THE TEXAS COMPANY, Dept. H., 17 Battery Pl., New York City


WITH A LITTLE PRACTICE I WON'T SPILL MORE THAN *HALF* THE OIL!
STEADY, JOE!
THE OLD WAY
NO GREASY CAN OR OILY FUNNEL TO STOW AWAY
THE NEW WAY

IN the left hand sketch Mr. "Rube Goldberg," the cartoonist, emphasizes the absurdity of oiling a car the "Old Way." In the other drawing he shows the convenience and cleanliness of the "New Way"—the Texaco Easy Pour Can.

The Texaco Easy Pour Can contains two quarts of Texaco Motor Oil. The top reaches the filler pipe. Does away with the messy funnel altogether. It is quick—clean. It wastes no oil—it is handy.

But even of greater importance is its insurance value—for with one of them tucked away in your car you will never be stuck on the road for want of oil.

When your car needs oil, screw off the cap, punch the safety seal with a screwdriver, a nail—or anything. Pour out enough oil. It goes where you want it in a jiffy, without spilling.

If any oil is left screw on the cap, tight. Put back the can. You don't waste any oil.

Try one and you will never buy oil any other way.

Buy a Case
of 20 two quart cans for your home garage

Keep an Easy Pour Can in your car always—it stows away like a Thermos bottle. Have good oil where you need it most.

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There Is a Texaco Lubricant for Every Purpose